

Certification Summaries and Desktop Assessments Ensure Protection for FUSRAP Completed Sites - 22194

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ABSTRACT

The Formerly Utilized Sites Remedial Action Program (FUSRAP) was established in 1974 to identify, investigate, and clean up or control radioactively contaminated sites eligible for remediation under the program. Remedial action work began in 1979 and the US Department of Energy (DOE) remediated 25 sites before Congress transferred responsibility for FUSRAP to the US Army Corps of Engineers (USACE) in 1997. The March 17, 1999, Memorandum of Understanding (March 1999 MOU) between DOE and USACE defines USACE's responsibility for remediating FUSRAP sites within the framework of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (also called the National Contingency Plan). After remediation, USACE retains responsibility for the site for 2 years before transferring the site to DOE for long-term stewardship of the remedy.

In 2003, the DOE Office of Legacy Management (LM) was created and was assigned responsibility for DOE FUSRAP activities defined in the March 1999 MOU. LM fulfills DOE's post-closure responsibilities; ensures the future protection of human health and the environment; and preserves, protects, and shares legacy records and information with the public. Those sites remediated under the FUSRAP program and transferred to DOE for long-term stewardship are known as "completed sites." As of 2021, completed FUSRAP sites, which are dispersed across the United States, comprise 34 of the 101 LM sites. These 34 sites have progressed from their original purpose in support of Manhattan Engineer District and US Atomic Energy Commission operations during the 1940s through the 1960s, through remediation, to become successful examples of beneficial reuse in their local communities. Remediation at many of these sites occurred up to 40 years ago, and sites are constantly being renovated for new uses. Seventeen sites have been revitalized, and three are pending redevelopment.

FUSRAP completed sites are classified as either Category 1 (29 sites) or Category 2 (5 sites). Category 1 sites typically have no institutional controls (ICs), and long-term surveillance and maintenance (LTS&M) requirements are limited to records management and stakeholder support. Category 2 sites can require routine inspections to verify ICs, environmental monitoring, and site maintenance, along with records management and stakeholder support. Most sites were remediated to a condition that allows unlimited use and unrestricted exposure.

The strategy for management of completed sites has evolved over time. Initially, no long-term reviews were conducted for remediated sites. In the early to mid-2000s, periodic site visits and property owner interviews were performed. Currently, site visits are conducted on an ad-hoc basis, usually in conjunction with inspections of sites under active remediation. Additionally, certification summaries and desktop assessments are two principal tools used by LM to ensure that completed sites remain protective of human health and the environment. The primary objective of the certification summaries is to summarize final conditions as described in the certification dockets prepared by DOE for DOE-remediated sites. The dockets consist of voluminous site cleanup documentation, making it difficult to locate relevant information. The certification summaries provide LM stakeholders concise, easy-to-understand, and visually appealing text, tables, and maps describing the analytical data used to certify that a site met cleanup requirements. A timeline and description of activities at each site are also provided.

Annual desktop assessments are conducted for eight sites that were either released with supplemental

limits applied to areas of inaccessible contamination or released for unrestricted use as long as land use remains industrial. The desktop assessment determines whether current usage is consistent with the remedy by assessing changes in land use, ownership, or regulatory requirements. When stakeholders call with questions on the extent and quality of cleanup, the certification summary and desktop assessment allow for rapid identification of pertinent information, resulting in timesaving and efficient responses to such inquiries.

LM stewardship for FUSRAP sites is expected to expand by six sites in the next 5 years, with an additional 15 sites anticipated by 2038. These sites, which are being remediated by USACE under the CERCLA process, will be more complex, requiring long-term sampling and IC management. At transfer to LM, site documentation will include summary-level Post-Remedial Action Reports and Site Closeout Reports that provide concise project details, figures, and data summaries in one easily referenced package. This precludes the need to continue with preparation of certification summaries for those sites.

Certification summaries, desktop assessments, site inspections, and IC management are valuable tools that allow LM to ensure that completed FUSRAP sites continue to meet LTS&M requirements; provide the ability to disseminate pertinent site information quickly and easily to colleagues; and assist in efficient responses to stakeholder inquiries. These outcomes result in tangible benefits to taxpayers and local communities by reducing post-closure costs associated with ensuring protection of human health and the environment.

INTRODUCTION

The Formerly Utilized Sites Remedial Action Program (FUSRAP) was established in 1974 to identify, investigate, and clean up or control radiologically contaminated sites eligible for the program. Over 600 sites were reviewed, and 46 sites were identified for cleanup. The US Department of Energy (DOE) began remediation in 1979 and completed 25 sites before Congress transferred responsibility for investigation and remediation of FUSRAP sites to the US Army Corps of Engineers (USACE) in 1997. The March 17, 1999, Memorandum of Understanding (March 1999 MOU) between DOE and USACE defines USACE's responsibility for remediating FUSRAP sites within the framework of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (also called the National Contingency Plan). After remediation, USACE retains responsibility for the site for 2 years before transferring the site to DOE for long-term stewardship of the remedy.

In 2003, the DOE Office of Legacy Management (LM) was created and assigned responsibility for DOE FUSRAP activities defined in the March 1999 MOU. LM fulfills DOE's post-closure responsibilities, ensures the future protection of human health and preserves, protects, and shares legacy records and information with the public. LM protects human health and environment by consulting with our communities to make informed decisions that comply with environmental laws, regulations, and agreements; support environmental justice; and demonstrate respect for the environment.

Those sites remediated under the FUSRAP program and transferred to DOE for long-term stewardship are known as "completed sites. As of the end of 2021, remediated (or "completed") FUSRAP sites, which are dispersed across the United States, comprise 34 of the 101 current LM sites. Figure 1 presents the geographic reach of completed sites. Figure 2 presents the timeline of site transfers for current completed sites.

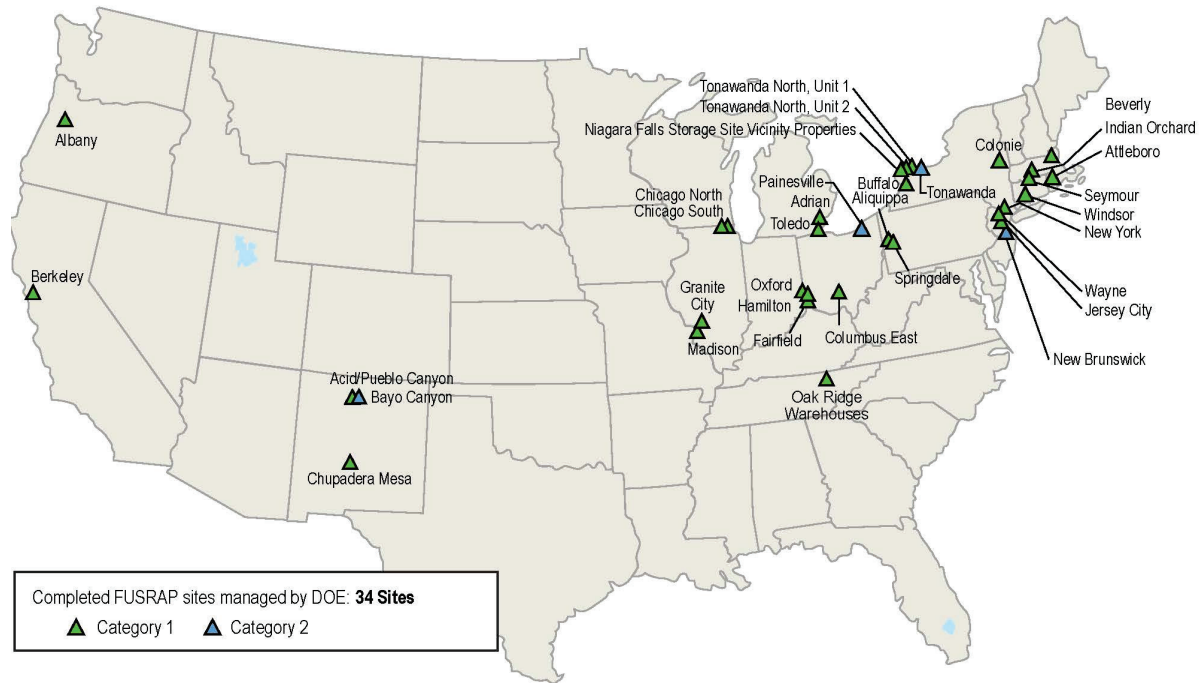
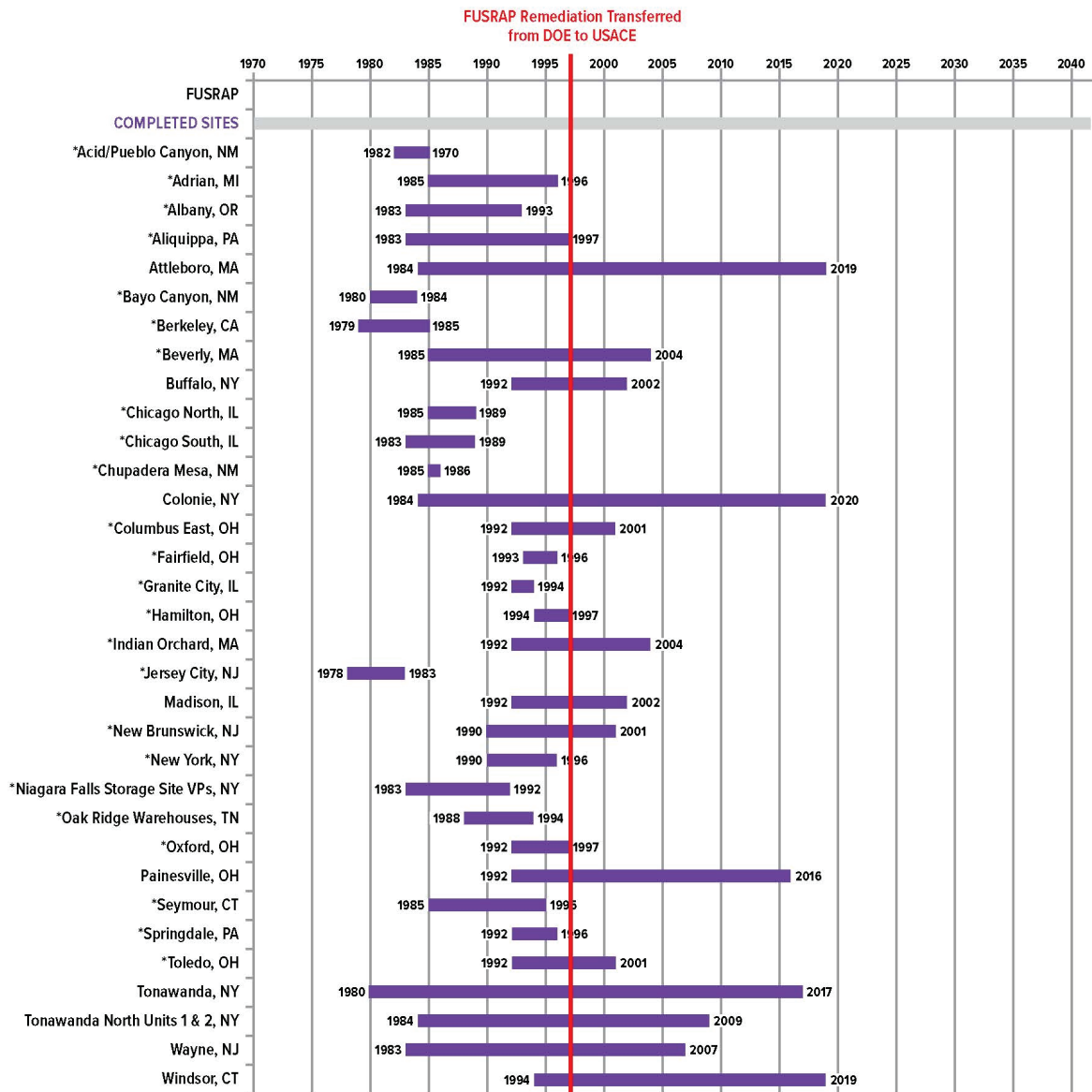


Figure 1. FUSRAP Completed Sites Locations

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Listed years are fiscal years.

* Sites completed by DOE as listed in Attachment A of the 1999 Memorandum of Understanding

** Middlesex North completed by DOE in 1989 and referred back to USACE in 2009. The site was redesignated as an Active Site in 2014.

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NOTE: Graphic was assembled by review of original source documents but is for informational purposes only. Some information may be dated or approximated. Some definitions have changed over time. Consult the current LM Site Management Guide for authoritative dates.

Figure 2. Timeline of FUSRAP Site Transfers

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It has now been over 40 years since completion of the earliest FUSRAP sites. Technology has improved, resulting in easier access to site information. There is now a generation of property owners and managers that are removed from the original use and remediation of these sites, As a result, LM occasionally reevaluates our understanding of the sites and reexamines our long-term surveillance strategy depending on stakeholder concerns. This reevaluation ensures that management of the completed sites addresses these evolving changes. It also ensures that LM meet its obligation to develop sound data-based technical evaluations to understand current conditions at LM sites and implement protective ICs where necessary. These efforts, used in combination, are intended to result in actions that reduce site-specific risks not only to human health and the environment, but also to support risk reductions in all other categories – regulatory, stakeholder relations, and ICs.

DESCRIPTION

Historical Site Usage

From 1942 to 1946, more than 10 contractors and several hundred subcontractors were involved in production, research, and other operations involved in the development of atomic weapons in support of the Manhattan Engineer District (MED). In 1947, MED responsibilities transferred to the Atomic Energy Commission (AEC). Virtually all of this work was performed by private contractors for the government on land that was federally, privately, or institutionally owned.

Uranium ore was procured from African, Canadian, and domestic sources and shipped to temporary storage and assay facilities. Ore materials were refined by grinding and crushing, then treating with acid to extract the uranium. Uranium was produced in various forms for use in further weapons development activities. Several sites also served as disposal locations for waste materials. To a lesser degree, thorium ore was also processed in MED/AEC facilities. In the 1950s and 1960s, uranium and thorium processing activities gradually shifted from private enterprises to government-owned facilities. At the termination of contracted MED/AEC activities, the sites involved were decontaminated according to the health and safety criteria and guidelines then in use.

Types of Contamination

The major contaminant at many FUSRAP sites is natural uranium (i.e., uranium in natural isotopic abundances that have not been enriched or depleted in uranium-235 [²³⁵U]) that was previously refined at other locations where daughter products were removed. Other FUSRAP sites were involved in storage of or the actual processing of uranium ore, so uranium daughter products may be present in the waste stream.

Pre and Post 1997 FUSRAP Remediation Approach

DOE began remediating sites under FUSRAP in 1979. The initial remediation activities focused on sites where conditions were more straightforward in terms of size, nature, and extent of contamination than sites with more challenging and complex conditions where remediation extended for several years or decades (or may be in progress). DOE implemented a multiphase approach to characterize sites, identify appropriate remedial activities, conduct remediation and waste disposal, prepare a final report, and assemble materials for a certification docket. The agency also established programmatic guidelines for the cleanup of residual concentrations of radionuclides in soil, air and water; concentrations of airborne radon decay products, external gamma radiation levels, and surface contamination levels

USACE has performed FUSRAP site remediation within the framework of CERCLA since 1997. Due to the requirement of following the CERCLA process, sites transferred by USACE have completion reports that provide concise project details, figures, and data summaries in one easily referenced package. These sites also transfer with administrative records which are kept available for public use.

Long-Term Surveillance and Maintenance Requirements

FUSRAP completed sites are classified as either Category 1 or Category 2. Category 1 sites requirements

for long-term surveillance and maintenance (LTS&M) are limited to records management and stakeholder support. Category 2 sites may require routine inspections to verify ICs, environmental monitoring and site maintenance, as well as records management and stakeholder support. ICs are required to limit human and environmental exposures to residual contamination by controlling land use, restricting access to potential hazards, and making the public aware of potential dangers from the residual contamination. ICs include legal instruments (such as land use restrictions), physical or engineering controls (such as fences, signs, and disposal cells), and methods for providing information to people about a site's cleanup history, including information on the remedy and current LTS&M activities. Of the 34 completed sites, 29 are classified as Category 1 and 5 are classified as Category 2.

The Category 1 FUSRAP sites assigned to DOE for long-term stewardship do not warrant a standalone LTS&M Plan; therefore, LTSM requirements for these 31 completed sites are consolidated within a single plan. Three Category 2 sites, Colonie, New York, Site; Painesville, Ohio, Site; and Tonawanda, New York, Site, are covered under standalone LTS&M Plans. Each plan contains site-specific information describing the following: site conditions, remedial action, LTS&M requirements, and references. Figure 3 presents the primary techniques used for LST&M for our sites.



Figure 3: Techniques for LTS&M at FUSRAP Completed Sites

Each completed site has a public-facing webpage, factsheet, and site video. LM also retains site historic records in the publicly available Considered Sites Database. For the completed sites, the database contains documents describing MED or AEC involvement, eligibility key remediation documents such as radiological surveys and certification of completion of remedial activities called a certification docket. In some cases, it also includes a federal registrar notification of the completion of remediation activities.

Current Site Usage

The operational purposes of completed sites have changed over time: from historic industrial purposes, to supporting MED/AEC operations during the 1940s, 50s, and 60s; through remediation; and many now serve as successful examples of beneficial reuse to their local communities. Of the 34 completed sites only 2 have been under government ownership, all others have been privately owned. Currently, 17 sites have been revitalized and three are pending redevelopment. As most of these sites were privately owned, they were able to be utilized for other purposes without government intervention due to the cleanup that has occurred.

Two examples of site revitalization are the Wayne and New Brunswick, New Jersey, sites. The Wayne site had been used in the 1940s for processing monazite sand to extract thorium and rare-earth metals. The property was remediated and, in 2006, transferred from DOE to Wayne Township for park and recreational use under the National Park Service's Lands to Parks Program. The township has constructed a public playground and dog park on the site (Figure 4). The former New Brunswick Laboratory site was used for nuclear reactor and weapons programs from 1948 to 1977. By 2001 the property had been remediated by DOE and in 2009 the property was sold to a private owner. This property has since been developed as a waste transfer station.



Figure 4. Before and After – Wayne, New Jersey, Site

DISCUSSION

The strategy for completed sites management has evolved over time. Initially, sites were remediated and handed back to the property owners, and no long-term reviews were completed. In the early to mid-2000s, periodic site visits were performed, along with interviews with property owners regarding land and building use. Currently, site visits are conducted on an ad-hoc basis, usually in conjunction with inspections of sites under active remediation. Two primary tools that assisted with the reduction of inspection efforts are certification summaries and desktop assessments. These tools are used by LM to ensure that sites remain protective of human health and the environment and respond accurately to stakeholder inquiries.

Certification Summaries

Certification summaries are 2- to 4-page documents that describe the post-remediation conditions at completed sites (Figure 5). These summaries condense the information found in voluminous DOE site certification dockets (Figure 6) into a concise, easy-to-understand, and visually appealing text. Each certification summary provides the most relevant information from the certification docket, including a description and timeline of site activities (including post-remediation sampling), a map of site features (Figure 7), and, if available, tables of the analytical data used to certify that the site met cleanup requirements. From August 2016 to December 2019, 34 certification summaries were developed in support of the FUSRAP program.

Certification summaries can be provided to LM stakeholders when there are questions about the status of a site. However, the summaries are only as good as the information provided in the certification dockets. Some problems with site documentation were discovered over the course of the certification summary project:

- (1) Dockets for sites remediated in the 1980s (e.g., the Bayo Canyon, New Mexico, Site) tend to contain less information and post-remediation analytical data than the dockets for sites remediated later. In some cases, supplemental reports referenced in dockets could not be located. The information and data contained in dockets became more comprehensive and standardized as the DOE FUSRAP program progressed. Therefore, summaries for sites remediated in the 1990s are generally more complete than the summaries for those sites remediated earlier.
- (2) In a few cases, there were discrepancies between the post-remediation analytical data and the text. Examples include (a) analytical results assigned to an incorrect sampling location, and (b) results bolded in a table to indicate that the result was above the background concentration when the result was actually below background. Notes were added to the analytical data tables when discrepancies like these were discovered (e.g., in the tables for the Painesville, Ohio, Site).
- (3) Discrepancies in or the lack of geospatial data related to completed sites resulted in unclear certification summary maps. For example, in the map for the Granite City, Illinois, Site, the parcel that was certified clean (as recorded in the *Federal Register* and referenced in the docket) does not actually contain the formerly contaminated building. This discrepancy is likely to be the result of clerical errors or changes in land parcels, rather than any confusion about the location of the formerly contaminated building; but it is a good illustration of problems that were encountered with geospatial data.
- (4) Most of the features included on the certification summary maps were digitized from copies of original figures, which means that the features are only as accurate as the analyst's ability to georeference them. Drawings, rather than maps, of site features were included in some certification dockets (e.g., for the Oxford, Ohio, Site). Many of these drawings could not be georeferenced, didn't appear to be drawn at the scale specified, or didn't provide a scale. Problems like these constrained what could be included on the maps.

Despite problems with site documentation, certification summaries include the most relevant and best available information and data for completed FUSRAP sites. As such, they are a valuable reference tool for both LM and LM stakeholders.

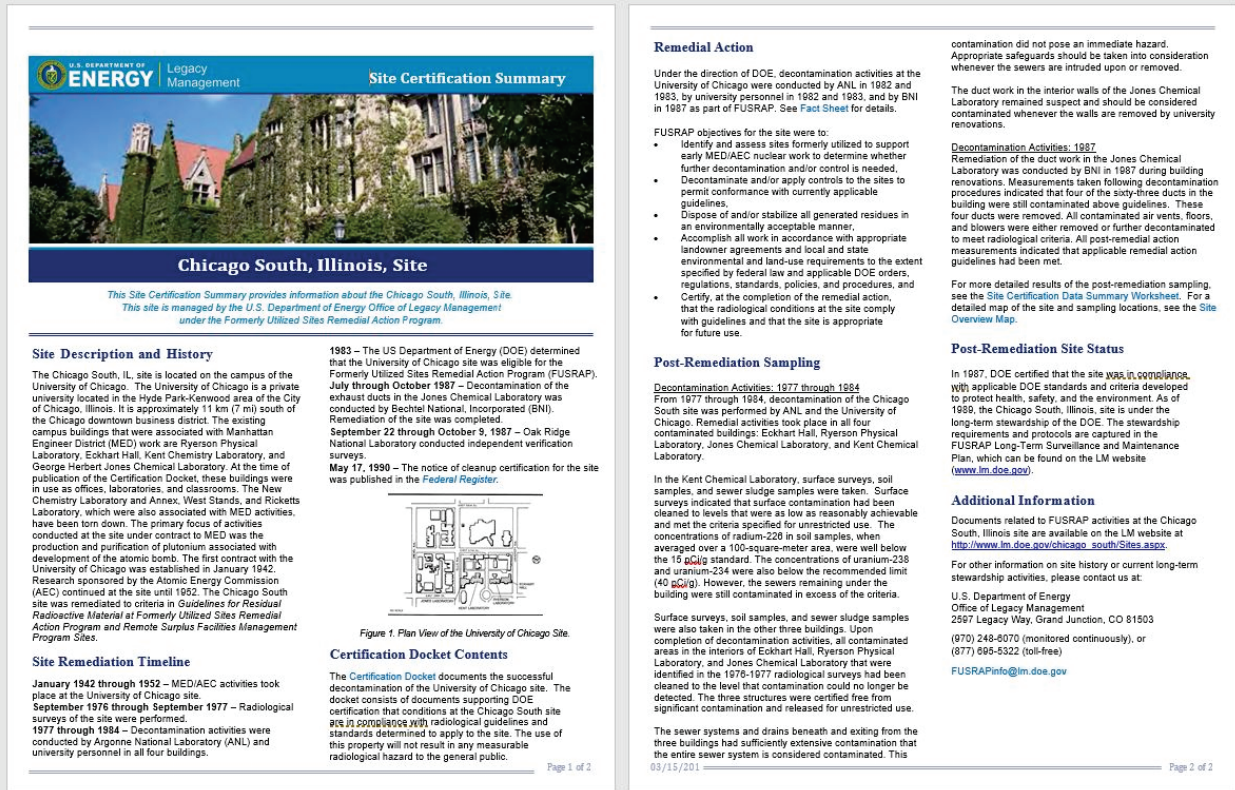


Figure 5. Example of a 2-page Certification Summary

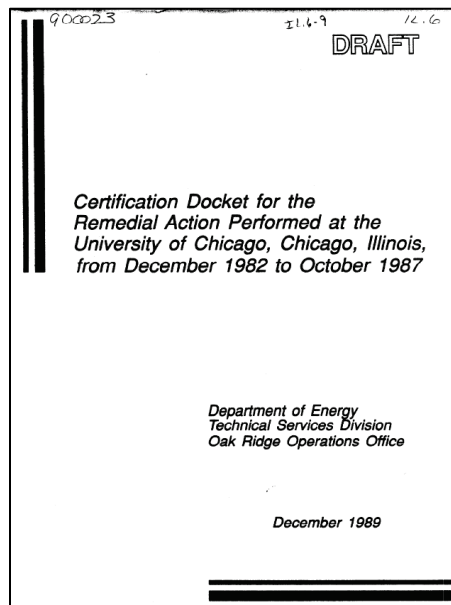


Figure 6. Title Page from the 199-page DOE Certification Docket for the Chicago South, Illinois, Site

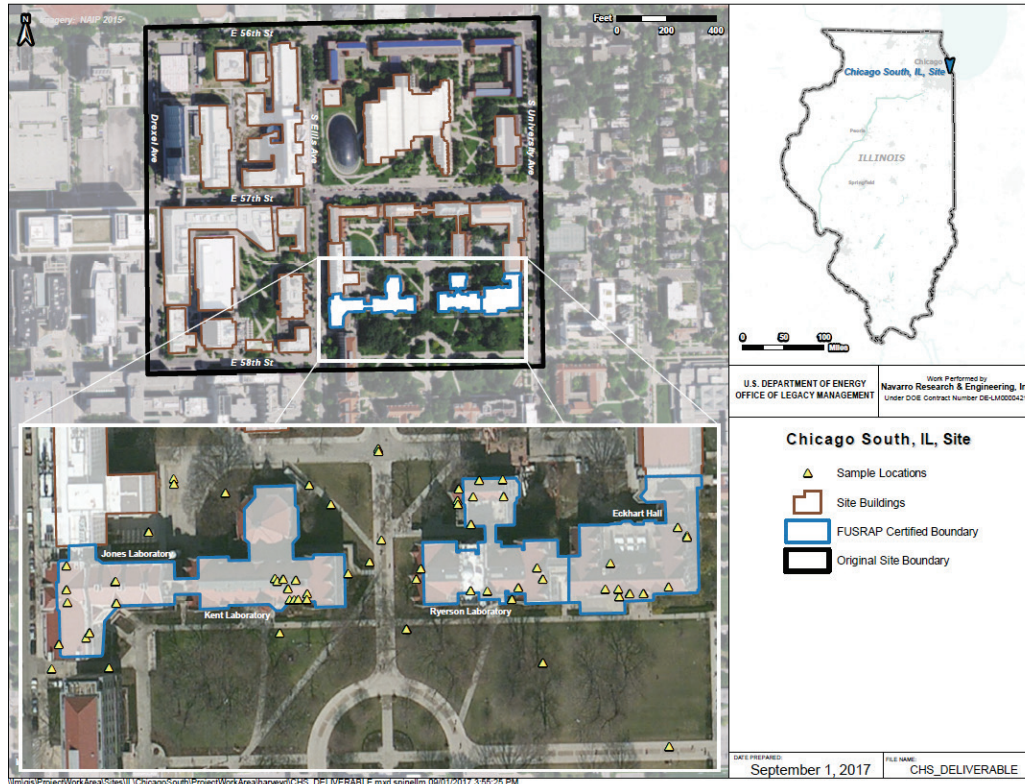


Figure 7. Example of a Certification Summary Map

Desktop Assessments

Desktop assessments are a formal way to document the investigation of any change in land use, regulations, or stakeholder interest that may impact a remedy at a completed site. The assessments were designed to ensure that LM is aware of potential changing conditions related to Category 1 and 2 LTS&M sites. A well-documented assessment of potential changes is performed annually, and the results are used to determine if the LTS&M Plan for a site needs to be adjusted. Desktop assessments have been performed since 2017 for five completed sites containing supplemental limits and an additional three sites requiring industrial land use or soil excavation restrictions.

Supplemental limits are contaminant concentration limits that can be applied on a site-specific basis if residual concentration guidelines for radionuclides in soils or authorized limits established for a given site are not appropriate for a portion of that site or for a vicinity property, as explained in former DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, Chapter 7, paragraph 4). The paragraph 4 scenario warranting DOE use of supplemental limits for specific completed sites said:

- Where the cost of remedial action for contaminated soil is unreasonably high relative to long-term benefits and where the residual material does not pose a clear present or future risk after taking necessary control measures. Remedial action will generally not be necessary where only minor quantities of residual radioactive material are involved or where residual radioactive material occurs in an inaccessible location at which specific property factors limit its hazard and from which it is difficult or costly to remove. Examples include residual radioactive material under hard-surfaced public roads and sidewalks, around public sewer lines, or in fence-post foundations.

Most of the 34 FUSRAP completed sites were remediated to a condition that allows unlimited use and unrestricted exposure (UU/UE). For UU/UE, a total effective dose equivalent (TEDE) of 100 millirem per

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year (mrem/yr) for a residential or subsistence farming exposure scenario was used for sites remediated by DOE prior to 1997. This criterion was specified in former DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, which was superseded in 2011 by DOE Order 458.1 Chg 2, *Radiation Protection of the Public and the Environment*. (The current version is DOE Order 458.1 Chg 4 (LtdChg), which became effective on September 15, 2020.) For sites remediated by USACE after 1997, the US Nuclear Regulatory Commission standard TEDE of 25 mrem/yr, from Title 10 *Code of Federal Regulations* Section 20.1402 (10 CFR 20.1402), was typically used as the release criterion. In both cases, through application of the “as low as reasonably achievable” approach, final dose rates were typically far less than the DOE criterion of 100 mrem/yr.

DOE applied supplemental limits to sites with elevated levels of radiological contamination that exceeded the established cleanup standard under the former DOE Order 5400.5 and that was left in place. These supplemental limit areas were typically designated because of their inaccessibility beneath utility structures or buildings. The designation of these areas was in compliance with the former DOE Order 5400.5, Chapter 7, paragraph 4. For these sites, LM conducts an annual desktop assessment to ensure current land usage is consistent with the remedy and to determine whether a site visit is necessary.

Desktop assessments are also conducted for three sites that were released for unrestricted use and do not contain supplemental limits. For two of these sites, desktop assessments are conducted to verify that the site land use remains industrial as a protective measure. For the remaining site, a desktop assessment is conducted to verify that a deed notice restricting excavation in one portion of the site remains in place.

A 2018 technical workshop reviewed available data for nine of the sites with supplemental limits. The review determined that residual contamination remained inaccessible and is in a safe configuration. As property owners make improvements to or eliminate existing structures with inaccessible contamination, the demolition debris would not require disposal as regulated radioactive waste. No additional ICs would be required for these sites, and risk calculations showed no unacceptable risk with current land use.

The following recommendations were made:

- Recategorize seven sites from Category 2 to Category 1 and continue to perform a desktop assessment at an appropriate frequency until the residual radioactive materials have been removed or decay calculations show that no further risk exist. Existing supplemental limits remain protective and residual contamination remains in a safe configuration.
- Recategorize two other sites from Category 2 to Category 1. No future desktop assessments are required. Residual radioactive materials to which supplemental limits were applied have been removed. There is no need for restrictions on future use or further LM waste management responsibility at these sites.

In 2019, the internal guidance document *Guidelines for Performing FUSRAP Completed Sites Desktop Assessments* was developed to formalize the steps required for the completion of desktop assessments. This document presents each item contained in the assessment and explains how the information is obtained and verified. Figure 8 provides an example of the process used to verify site land use, as described in the guidance.

Section III: Land Use

Future land use identified in Certification Docket or Site Closeout Report (SCR) consistent with property owner's vision:

- Reference the Certification Docket or SCR to determine the property's intended land use. This information is on the LM Considered Sites webpage for each applicable site.
- Use the following resources to determine if there is an expected change in the anticipated future land use.
 - o Online articles or publications that reference the site address or property owner.
 - o The official website of the city, borough, or township
 - o The applicable city or county planning or zoning department
 - o Meeting minutes from planning or zoning committee meetings
 - o Community development organization plans
 - o The email address or phone number of the site property owner or representative
- Include any relevant figures obtained using the resources listed above.
- Include sources referenced.
- If a change in anticipated future land use is discovered by way of the above sources, the information will be verified by contacting the county's zoning or planning department, the current site owner or POC.

Current land use:

- Reference the most recent aerial photograph obtained by ESDM.
- Contact the current site owner or POC
- Search online sources such as:
 - o Google Maps
 - o The official website of the applicable city or county:
 - Zoning department
 - City planner
 - City or county GIS department
 - o Reference any recent trip reports
- Include sources and dates of reference.

Current land use adjacent to the site:

- Coordinate with the GIS analysts in the ESDM group to obtain the most current and appropriate imagery available via EarthExplorer, which is updated and maintained by USGS. If current imagery products are not available through EarthExplorer, background imagery may be downloaded and properly sourced from Google Earth or purchased from providers such as DigitalGlobe. Ensure that the resulting figure or figures depict the FUSRAP site boundary and pin (i.e., centroid) for the applicable site overlaid on the background imagery.
- Reference any available online resources, including:
 - o Google Maps
 - o The official website of the applicable city or county:
 - Zoning department
 - Assessor's office
 - City or county GIS department
- Reference recent trip reports and inspection photos.
- Include sources referenced.

Figure 8. Example of the Desktop Assessment Review Process for Assessing Land Use

Desktop assessments are completed in February of each calendar year. In 2022, a five-year protectiveness review will be conducted for the Category 2 sites with ICs or industrial land use scenarios (i.e., for the New Brunswick, Painesville, and Tonawanda sites). It is anticipated that this review will result in the recommendation to downgrade Painesville and Tonawanda to Category 1 sites. While the desktop assessment requirement for these two sites will remain, the sites will no longer require separate LTS&M

Plans.

Looking Forward

LM stewardship for FUSRAP sites is expected to expand by four sites in the next 5 years, with an additional 17 sites anticipated by 2039. These sites, which are being remediated by USACE under the CERCLA process, will be more complex, requiring long-term sampling and IC management. At transfer to LM, site documentation will include summary-level Post-Remedial Action Reports and Site Closeout Reports that provide concise project details, figures, and data summaries in one easily referenced package. This data will eliminate the need to continue with preparation of Certification Summaries for future sites. Desktop assessments will continue for the eight sites identified as requiring them, but desktop assessments will not be required for future completed sites. It is anticipated that future completed sites will entail more active site management, including annual site visits, which will negate the need for desktop assessments.

LM continues to incorporate geographic information systems in its ongoing stewardship of sites, including Completed Sites. Within the FUSRAP program, support staff are developing an interactive program interface whereby both LM site managers and LMS contractor personnel can quickly access and analyze authoritative spatial data, key documents, and other records with the goal of improving decision-making. This application can be used as an educational tool and also allows staff to review and monitor site conditions and better plan projects and site visits. Other geospatial technologies are being explored with the goal of improving operational efficiency, reducing project costs, and improving site inspection and monitoring activities.

CONCLUSIONS

As LM moves further from the remediation of sites, we periodically reevaluate our understanding of the sites and reexamine our long-term surveillance strategy depending on stakeholder concerns. Certification summaries and desktop assessments are valuable tools that allow LM to ensure that completed FUSRAP sites continue to meet LTS&M requirements; provide the ability to quickly and easily disseminate pertinent site information to colleagues; and assist in efficient responses to stakeholder inquiries. This results in a reduction of site-specific risks not only to human health and the environment, but also for regulatory, stakeholder relations, and institutional controls.

REFERENCES

[10 CFR 20.1402. US Nuclear Regulatory Commission, “Radiological Criteria for Unrestricted Use,” Code of Federal Regulations.](#)

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[DOE, 2018b. Legacy Management Program Management Plan for Formerly Utilized Sites Remedial Action Program, LMS/S16063-0.1. April](#)

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